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In re application of: Elfring *et. al.*

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For: HIGH SOLAR REFLECTANCE COATING COMPOSITION

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Declaration of William H. Elfring Under 37 CFR 1.132

I, William H. Elfring, of 7107 McCallum Street, Philadelphia, PA, 19119, received my Ph.D. in Inorganic Chemistry from University of Washington, in March 1972.

I have been employed by Rohm and Haas Company since November 26, 1974, currently as a Senior Scientist in Architectural and Functional Coatings. I have been involved in research and development of interior and exterior coatings since November 26, 1974.

Under my direction William Stellwagen prepared the elastomeric coating formulations of Examples 1, 2, and 3, as described below.

Preparation Example 1

A conventional elastomeric roof coating formulation was prepared as set forth in Table 1.

Table 1

Material	Material Type	Pounds	Gallons	Level
Water	Solvent	164.20	19.67	
Tamol 850 (1)	Dispersant	4.80	0.48	
KTPP (2)	Dispersant	1.43	0.09	
Nopco NXZ (3)	Defoamer	3.80	0.50	
Duramite (4)	Extender	422.10	18.71	36.46% PVC
Zinc Oxide	Pigment / Mildewstat	46.90	1.01	1.97% PVC
Ti-Pure R-960 (5)	Pigment	70.40	2.18	4.24% PVC
Ethylene Glycol	Solvent	24.40	2.62	
Natrosol 250 MR (6)	Thickener	4.20	0.39	
Latex 1		458.80	53.32	
Texanol (7)	Coalescent	7.00	0.88	
Skane M-8 (8)	Biocide	2.10	0.24	
Ammonia (9)	Base	1.00	0.13	
Total		1211.13	100.22	42.67% PVC

- (1) Ammonium salt of a polymeric carboxylic acid (35%) in water (Rohm and Haas Company, Philadelphia, PA)
 (2) Potassium tripolyphosphate
 (3) Petroleum derivatives (Diamond Shamrock Corporation, Morristown, NJ)
 (4) Calcium carbonate (Thompson-Weiman & Co., Cartersville, GA)
 (5) Rutile titanium dioxide (E. I. du Pont de Nemours & Co., Inc., Wilmington, DE)
 (6) Hydroxyethylcellulose (Hercules, Inc., Wilmington, DE)
 (7) Eastman Kodak, Rochester, NY
 (8) Rohm and Haas Company, Philadelphia, PA
 (9) 28% aqueous ammonia solution

Preparation Example 2

An elastomeric roof coating formulation was prepared as set forth in Table 2.

Table 2

Material	Material Type	Pounds	Gallons	Level
Water	Solvent	153.40	18.38	
Tamol 850 (1)	Dispersant	4.50	0.45	
KTPP (2)	Dispersant	1.36	0.08	
Nopco NXZ (3)	Defoamer	3.60	0.48	
Duramite (4)	Extender	315.50	13.98	29.18% PVC
Zinc Oxide	Pigment / Mildewstat	43.70	0.94	1.96% PVC
Ti-Pure R-960 (5)	Pigment	65.70	2.03	4.24% PVC
Ethylene Glycol	Solvent	22.80	2.45	
Natrosol 250 MR (6)	Thickener	3.90	0.36	
Latex Blend 1		515.80	59.89	7.27% PVC ^(a)
Texanol (7)	Coalescent	6.50	0.82	
Skane M-8 (8)	Biocide	2.00	0.23	
Ammonia (9)	Base	0.90	0.12	
Total		1139.66	100.21	42.65% PVC

(1) Ammonium salt of a polymeric carboxylic acid (35%) in water (Rohm and Haas Company, Philadelphia, PA)

(2) Potassium tripolyphosphate

(3) Petroleum derivatives (Diamond Shamrock Corporation, Morristown, NJ)

(4) Calcium carbonate (Thompson-Weiman & Co., Cartersville, GA)

(5) Rutile titanium dioxide (E. I. du Pont de Nemours & Co., Inc., Wilmington, DE)

(6) Hydroxyethylcellulose (Hercules, Inc., Wilmington, DE)

(7) Eastman Kodak, Rochester, NY

(8) Rohm and Haas Company, Philadelphia, PA

(9) 28% aqueous ammonia solution

(a) Note: Solid, particulate, organic polymer with a T_g greater than 70°C is replacing inorganic material.

Preparation Example 3

An elastomeric roof coating formulation was prepared as set forth in Table 3.

Table 3

Material	Material Type	Pounds	Gallons	Level
Water	Solvent	143.80	17.23	
Tamol 850 (1)	Dispersant	4.20	0.42	
KTPP (2)	Dispersant	1.26	0.08	
Nopco NXZ (3)	Defoamer	3.50	0.46	
Duramite (4)	Extender	221.60	9.82	21.86% PVC
Zinc Oxide	Pigment / Mildewstat	41.00	0.88	1.97% PVC
Ti-Pure R-960 (5)	Pigment	61.70	1.91	4.24% PVC
Ethylene Glycol	Solvent	21.40	2.30	
Natrosol 250 MR (6)	Thickener	3.70	0.34	
Latex Blend 2		566.00	65.67	14.58% PVC ^(a)
Texanol (7)	Coalescent	6.10	0.77	
Skane M-8 (8)	Biocide	1.80	0.21	
Ammonia	Base	0.90	0.12	
Total		1076.96	100.21	42.65% PVC

(1) Ammonium salt of a polymeric carboxylic acid (35%) in water (Rohm and Haas Company, Philadelphia, PA)

(2) Potassium tripolyphosphate

(3) Petroleum derivatives (Diamond Shamrock Corporation, Morristown, NJ)

(4) Calcium carbonate (Thompson-Weiman & Co., Cartersville, GA)

(5) Rutile titanium dioxide (E. I. du Pont de Nemours & Co., Inc., Wilmington, DE)

(6) Hydroxyethylcellulose (Hercules, Inc., Wilmington, DE)

(7) Eastman Kodak, Rochester, NY

(8) Rohm and Haas Company, Philadelphia, PA

(9) 28% aqueous ammonia solution

(a) Note: Solid, particulate, organic polymer with a Tg greater than 70°C is replacing inorganic material.

Each of the formulations were then tested for solar reflectance as follows. Under my direction, William Stellwagen coated teflon-coated aluminum panels with the elastomeric roof coating formulations of Preparation Example 1 (PE 1), Preparation Example 2 (PE 2) and Preparation Example 3 (PE 3). The film draw-downs were at approximately 40 wet mils. Under my direction, William Stellwagen exposed the panels outdoors at Spring House, PA and Philadelphia, PA in the horizontal face-up position. By this is meant that the panels were placed outside, in a horizontal position, with the coated surface facing upward, and left there for the periods shown in Tables 4 and 5, where they were exposed to all of the elements normally occurring outdoors, including solar energy. Reflectance measurements were made by Rohm and Haas employees over the course of the exposures, and the results are set forth in Table 4, for exposures at Spring House, PA, and Table 5, for exposures at Philadelphia, PA.

Table 4

Time of Exposure (months)	Reflectance (1)			Solar Reflectance (2)		
	PE 1	PE 2	PE 3	PE 1	PE 2	PE 3
0	93	93	93	0.87	0.87	0.87
18	57	66.8	74.9	0.48	0.58	0.66
24	52.2	67.3	75.5	0.43	0.58	0.67
30	50.5	64.6	77.3	0.41	0.55	0.69
36	47.9	57.8	72	0.39	0.48	0.63
48	35.5	41.5	47.9	0.28	0.33	0.39
60	47.2	53.3	57.8	0.38	0.44	0.48
72	46.5	50.7	56.1	0.38	0.42	0.47
84	43.5	44.3	53	0.35	0.36	0.44
96	45	41.3	51.1	0.36	0.33	0.42
108	45.4	42.7	51.9	0.37	0.34	0.43

(1) Diffuse visible reflectance (%) was measured with a portable Gardner Colorgard II 45°/0° reflectometer.

(2) A calibration set of white to grey panels similar in type to those exposed were measured both with a Solar Spectrum Reflectometer Model SSR-ER (Devices & Services Co.) to obtain solar

reflectance values (SR) and with the Gardner Colorgard II 45°/0° reflectometer to obtain diffuse visible reflectance values (V). For these types of coatings, the relationship between the visible diffuse reflectance (V) and the solar reflectance (SR) was estimated, with a high degree of confidence, to be given by the equation:

$$SR = 0.0116097 + 0.0065362V + 0.0000286V^2$$

Table 5

Time of Exposure (months)	Reflectance (1)			Solar Reflectance (2)		
	PE 1	PE 2	PE 3	PE 1	PE 2	PE 3
0	93	93	93	0.87	0.87	0.87
18	37.6	51	63.5	0.30	0.42	0.54
24	38.2	52.9	63.8	0.30	0.44	0.55
30	41.9	55.5	65.7	0.34	0.46	0.56
36	40.2	56	65.8	0.32	0.47	0.57
48	40.2	53.1	59.8	0.32	0.44	0.50
60	46.7	55.1	62.1	0.38	0.46	0.53
72	44.9	51.6	57.3	0.36	0.43	0.48

(1) Diffuse visible reflectance (%) was measured with a portable Gardner Colorgard II 45°/0° reflectometer.

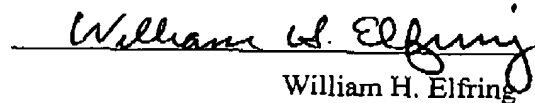
(2) A calibration set of white to grey panels similar in type to those exposed were measured both with a Solar Spectrum Reflectometer Model SSR-ER (Devices & Services Co.) to obtain solar reflectance values (SR) and with the Gardner Colorgard II 45°/0° reflectometer to obtain diffuse visible reflectance values (V). For these types of coatings, the relationship between the visible diffuse reflectance (V) and the solar reflectance (SR) was estimated, with a high degree of confidence, to be given by the equation:

$$SR = 0.0116097 + 0.0065362V + 0.0000286V^2$$

It is my belief that the method of the invention inhibits the loss of solar reflectance over time, regardless of the geographic location of the exterior surface on which the coating composition is deposited according to the method of the invention, and

regardless of the climate, weather conditions, etc. of that location. Thus, the invention's inhibition of the loss of solar reflectance over time is not limited to outdoor exposure of the coating composition of the invention, only at the testing sites. Rather, the invention inhibits the loss of solar reflectance in any geographic location, climate, or weather condition in which the exterior elastomeric coating is applied to an exterior (outdoor) surface according to the method of the invention.

I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under the United States Code and such willful statements may jeopardize the validity of any patent application or patent issued thereon.


William H. Elfring